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## COMPUTER TELEPHONY INTEGRATION

This invention relates to the use of a computer for controlling the operation of a telephony system, such use is known in the art as computer telephony  
5 integration (CTI), and the systems employing such control are known as CTI systems.

As a general background, the reader will find examples of such CTI systems disclosed in the articles "Introduction to Computer Telephony Integration", by A. Catchpole, G. Crook, and D. Chesterman, British Telecommunications Engineering, Vol. 14, July 1995; "Computer Telephony Integration - The Meridian Norstar", by A.  
10 Catchpole, British Telecommunications Engineering, Vol. 14, Oct. 1995; "Computer Telephony Integration - The Meridian 1 PBX", by P. Johnson, A. Catchpole, and L. Booton, British Telecommunications Engineering, Vol. 15, July 1996; "Callscape - Computer Telephony Integration for the Small Business", by G. Hillson, G. Hardcastle, and M. Allington, British Telecommunications Engineering, Vol. 15, Jan.  
15 1997, and "Call Centres - Doing Business by Telephone" by M. Bonner, British Telecommunications Engineering, Vol. 13, July 1994.

Furthermore, a method is known of operating a CTI system comprising a CTI-enabled PBX, an associated CTI controller, and a plurality of user workstations, each workstation comprising a computer connected to the CTI controller and a telephone  
20 connected to the PBX. In this method, the CTI controller stores respective user-associated profiles, each including a user-associated workgroup containing names of users of the system, in whose telephony status the user associated with that workgroup is interested, and the PBX on receipt of an incoming call retrieves from the signalling data a dialled number (known as the Dialed Number Identification  
25 Service number (DNIS)) and the calling line identity or identification (CLI), and passes these to the CTI controller. The CTI controller translates the DNIS to a username for the called user and accesses the workgroups to find out which contain that username. The CTI controller then sends a message containing that username to each computer at which a user, whose workgroup contains that username, is currently  
30 logged on to the CTI controller. It will be appreciated that in the art, the terms log on, logon, log in and login are synonymous and interchangeable, as are the terms log off, logoff, log out and logout.

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translating the detected calling line identity to obtain a corresponding actual calling party identity currently recorded as being associated with that line.

Alternatively, when the switching system comprises a CTI-enabled switch together with a CTI controller, and a plurality of user-associated computers  
5 connected to the CTI controller, the step of responding to a request for the making of a call by obtaining an actual calling party identity may comprise the substeps of detecting the identity of a computer from which a make call request has been sent to the CTI controller, and translating the detected computer identity to obtain a corresponding actual calling party identity for a user currently recorded as being  
10 logged on at that computer to the CTI controller.

Alternatively, the step of responding to a request for the making of a call by obtaining an actual calling party identity may comprise the substeps of retrieving from signalling information of an incoming call to the switching system a calling line identity, and translating the retrieved calling line identity to obtain a corresponding  
15 actual calling party identity.

Preferably, there is included the step of joining the incoming call to the call to the called party.

Alternatively, there may be included the steps of clearing down that incoming call, making a call to the calling party based on the calling line identity of  
20 that incoming call, and joining the call to the calling party to the call to the called party.

In accordance with a second aspect of the present invention there is provided a switching system comprising:

means for responding to a request for the making of a call by obtaining an actual  
25 calling party identity;

means for translating the obtained actual calling party identity to obtain a corresponding simulated calling line identity;

means for obtaining a called party identity; and

means for generating a setup signalling message to be sent for establishing a call to  
30 the called party, the setup signalling message having a calling line identity field containing the obtained corresponding simulated calling line identity.

Figure 7 shows the structure of part of a name-to-simulated calling line identity translation table used by the CTI server;

Figure 8 is a flow chart showing steps of making a call in accordance with a method of the present invention; and

5 Figure 9 is a flow chart showing steps of receiving a return call.

In this description the following acronyms are used :-

CLI - Calling Line Indication, also known as Calling Line Identity,

CSTA - Computer Supported Telecommunications Applications,

10 CTI - Computer Telephony Integration,

DNIS - Dialed Number Identification Service number,

DOT - Distributed Office Telephony,

ISDN - Integrated Services Digital Network,

IP - Internet Protocol,

15 LAN - Local Area Network,

PBX - Private Branch Exchange,

RAM - Random Access Memory,

ROM - Read Only Memory.

In Figure 1 there is shown a switching system, also referred to as a CTI  
20 system, 10, comprising a CTI-enabled PBX 12, constituting a switch of the present invention, connected to an ISDN 14 via an ISDN primary rate link 16, and a CTI server 18 connected to the PBX 12 via a data link 20. The PBX 12 has a CTI interface 22 which operates in accordance with the abovementioned CTI protocol, CSTA, and the CTI server 18 has a CTI interface 24 which operates in accordance  
25 with that protocol. There are a number of proprietary CTI protocols, e.g. Meridian Link from Northern Telecom, and several "open", or proposed standard, CTI protocols, including CSTA, but the performance of the present invention is not dependent upon the use of any particular CTI protocol.

The CTI system 10 also comprises a plurality of work desks, also known as  
30 workstations, 26R, situated remotely from the PBX 12, and a plurality of work desks 26L, situated locally to the PBX 12, each work desk having a respective telephone terminal 28R, 28L, referred to hereinafter as a telephone, and a respective computer

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by British Telecommunications plc (BT) to obtain a CLI and make a return call to that CLI, this being delivered to the current location of the calling user by the CTI system by inverse use of the translation tables. A simulated CLI of the present invention has the same digit format as a real CLI, and is inserted into the CLI field of a setup signalling message. It is treated by the receiving apparatus as a normal CLI, i.e. in the sense that it uniquely identifies a telephone from which the original call had been made, and to which a return call can be made. Calls made to the simulated CLI are delivered to the party associated with that simulated CLI by use of translation tables which hold information as to the identity of that party and his current recorded location. In this description, the server 18 constitutes a means for responding to a request for the making of a call by obtaining an actual calling party identity; also a means for translating the obtained actual calling party identity to obtain a corresponding simulated calling line identity, and also a means for obtaining a called party identity. The PBX 12 and the CTI server 18 together constitute a means for generating a setup signalling message to be sent for establishing a call to the called party, the setup signalling message having a calling line identity field containing the obtained corresponding simulated calling line identity. Where the user goes off hook at his telephone 28L, the PBX 12 and the CTI server 18 together constitute a said responding means arranged to detect the actual calling line identity of a line which has changed to off hook status, and to translate the detected calling line identity to obtain a corresponding actual calling party identity currently recorded as being associated with that line; and also a said responding means arranged to retrieve from signalling information of an incoming call to the switching system a calling line identity, and to translate the retrieved calling line identity to obtain a corresponding actual calling party identity.

As shown in Figure 4, the CTI program 50 comprises a number of main modules, namely a Configuration module 58, an Incoming Call module 60, an Outgoing Call module 62, and a Call Log module 64. As is known in the art, these main modules comprise submodules for performing various parts of their main function, for example, the Configuration module 58 comprises a Profile submodule 66 for managing the user profiles 52. As mentioned above, the present invention is not restricted to any one form of CTI program 50, which, for example, can be for

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recorded as being logged on at that client (step 92, Figure 8). This step is necessary if the user is permitted by the system administrator to log on at any of the work desks 26, and it will be appreciated that if another user, Steve, had logged on at that client, then the CTI server 18 will have entered the name Steve against that client's

5 IP address in the client identity-to-name translation table 54B.

Using the name just obtained, Bob, the Consistent CLI submodule 68 now refers to the name-to-simulated calling line identity translation table 54C to obtain the corresponding calling line identity, in this case, nnnnn 800800 (step 94, Figure 8). The Consistent CLI submodule 68 now makes this obtained calling line identity

10 available to the Outgoing Call module 62, which commands the PBX 12 to insert it into the calling line identity field of a setup signalling message, and to send this signalling message to the ISDN 14 via the ISDN primary rate link 16 (step 96, Figure 8). Thus, the called party having that called number will always receive the CLI nnnnn 800800 regardless of which of the work desks 26 the user, Bob, is currently

15 using.

The PBX 12 in the above embodiment has a highly sophisticated design, and can command the telephone 28L at the work desk where the user, Bob, is logged on to go into "hands-free" dialling mode, record the internal port as off-hook, make the outgoing call from an external port connected to the primary rate link 16, and

20 connect the internal and external ports.

In a variant, the PBX 12 is less sophisticated and has actual telephones 28L connected to internal ports, say, 000 to 199, and respective dummy terminals connected to internal ports, say, 200 to 399, which correspond to the allocated CLIs, e.g. the dummy terminal connected to internal port 234 corresponds to the CLI

25 nnnnn 800800. In this case, when the user Bob, who is currently logged on at a work desk 26L whose telephone 28L is connected to internal port 101, performs the Dial procedure, the translation stages are: client IP address to name (Bob) via table 54B, and name (Bob) to dummy terminal (234) via table 54C, which in this case is actually a dummy terminal-to-name translation table, but because of the one-to-one

30 correspondence with CLI (800800) within the control software of the PBX 12, is in conjunction with the PBX 12, effectively a name to CLI translation. In other words, the control software of the PBX 12 contains a table relating the dummy terminal

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18 has to provide the user's CLI, e.g. nnnnn 800800, to the PBX 12, together with the internal port number of the selected dummy terminal.

If in the first scenario the called party needed to telephone the user Bob, he would now be able to do so by virtue of the delivery of the CLI to the called number.

5 For example, the called party may have a display telephone which displays the CLI of incoming calls, or the called party may be using BT's "1471" service, and knowledge of that CLI, nnnnn 800800, will enable the called user to make a call to that number. Upon receipt of an incoming call at the PBX 12 having a DNIS nnnnn 800800 (step 100, Figure 9), the PBX 12 will retrieve this DNIS from the signalling information and

10 pass it to the CTI server 18 in a Route Request message. The CTI server 18 will access the name-to-simulated calling line identity translation table 54C using the retrieved DNIS and obtain the name, Bob (step 102, Figure 9). Then using this obtained name, Bob, the CTI server 18 will find Bob's current location Bob (step 104, Figure 9). The CTI server 18 accesses the client identity-to-name translation table

15 54B to see if there is an entry for Bob, and if there is, i.e. Bob is currently logged on at a work desk 26, the CTI server 18 will alert the user Bob at his client 30, using the Incoming Call module 60 in usual manner. If Bob is not currently logged on at a work desk 26, the CTI server will access the calling line identity-to-name translation table 54A to see if there is an entry for Bob at a remote telephone. If there is such an

20 entry, the PBX 12 will make an outgoing call to that remote telephone, and when it is answered, join that outgoing call to the incoming call made to the DNIS, nnnnn 800800 (step 106, Figure 9).

In another scenario, suppose that a user, who has the name Steve and who has been allocated the CLI nnnnn 800802, has made a call from his home telephone,

25 01473 nnnnnn, to a predetermined number of the PBX 12. The PBX 12 reports this telephony activity, including the CLI of the source of that call, i.e. 01473 nnnnnn, retrieved from the signalling information of the incoming call, to the CTI server 18 and returns a special services tone to the user Steve, who responds by keying a log on sequence of digits on his keypad (or by speaking these digits where the CTI

30 system includes an interactive voice response system). The CTI server 18 now knows that the user Steve is currently at 01473 nnnnnn, and enters this information in the translation table 54A. Subsequently, when the user Steve sends a log out



Thus, it can be seen that in general the present invention can be implemented in any computer controlled switch, by means of a suitable controlling program.

In the above specific embodiments, the called user is an individual person  
5 who normally works at a workstation. It will be appreciated that a DNIS need not correspond to an individual person, but may relate to a department or group, or a specific function within a company. Furthermore, more than one DNIS can correspond to such a function. As an example, a person can be allocated to a telephone sales function, and all calls made by him would have a common CLI for the  
10 sales department. In this way, a called party can return his calls directly to the sales department DNIS, and the CTI system can operate an automatic call distribution function on incoming calls to that department.

It will also be appreciated that the term CTI, although originating from the computer control of voice telephony, is not limited to voice communications and  
15 includes other types of communications, e.g. videotelephony, and multimedia.

Furthermore, whereas the abovedescribed specific embodiments are third party CTI arrangements, the skilled person will appreciate that the present invention is also applicable to first party CTI arrangements.

1. A method of operating a switching system to make a call, the method comprising the steps of
- 5 responding to a request for the making of a call by obtaining an actual calling party identity;
- translating the obtained actual calling party identity to obtain a corresponding simulated calling line identity;
- obtaining a called party identity; and
- 10 sending a setup signalling message for establishing a call to the called party, the setup signalling message having a calling line identity field containing the obtained corresponding simulated calling line identity.
2. A method as claimed in claim 1, wherein the step of responding to a request
- 15 for the making of a call by obtaining an actual calling party identity comprises the substeps of detecting the actual calling line identity of a line which has changed to off hook status, and translating the detected calling line identity to obtain a corresponding actual calling party identity currently recorded as being associated with that line.
- 20
3. A method as claimed in claim 1, for use when the switching system comprises a CTI-enabled switch together with a CTI controller, and a plurality of user-associated computers connected to the CTI controller, wherein the step of responding to a request for the making of a call by obtaining an actual calling party
- 25 identity comprises the substeps of detecting the identity of a computer from which a make call request has been sent to the CTI controller, and translating the detected computer identity to obtain a corresponding actual calling party identity for a user currently recorded as being logged on at that computer to the CTI controller.
- 30 4. A method as claimed in claim 1, wherein the step of responding to a request for the making of a call by obtaining an actual calling party identity comprises the substeps of retrieving from signalling information of an incoming call to the switching

computer from which a make call request has been sent to the CTI controller, and to translate the detected computer identity to obtain a corresponding actual calling party identity for a user currently recorded as being logged on at that computer to the CTI controller.

5

10. A system as claimed in claim 7, wherein the means for responding to a request for the making of a call by obtaining an actual calling party identity is arranged to retrieve from signalling information of an incoming call to the switching system a calling line identity, and to translate the retrieved calling line identity to
- 10 obtain a corresponding actual calling party identity.

11. A method of operating a switching system to make a call, substantially as hereinbefore described with reference to the drawings.

- 15 12. A switching system, substantially as hereinbefore described with reference to the drawings.

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## ABSTRACT

## COMPUTER TELEPHONY INTEGRATION

A CTI system including a translation table of user names against consistent  
5 (i.e. simulated) calling line identity. When a user originates a call, the CTI server  
knows the name of the user currently associated with, i.e. logged on at, the  
originating work desk, and refers to the consistent CLI translation table to obtain the  
consistent CLI for that user, and to instruct the switch to make the call using that  
consistent CLI in the setup signalling message. In some CTI systems, the consistent  
10 CLI translation table is in the form of a user-associated dummy terminal translation  
table, and the CTI server instructs the PBX to make a call from the respective user-  
associated dummy terminal. In this case, the PBX stores the consistent CLI  
corresponding to that dummy terminal. Calling users can originate calls from any of  
the systems work desks, or even from remote telephones, and the system will  
15 always deliver a setup signalling message containing the respective consistent CLI  
allocated to the calling user, thus enabling a return call to be properly delivered or  
recognised as such.

Figure (8)

20

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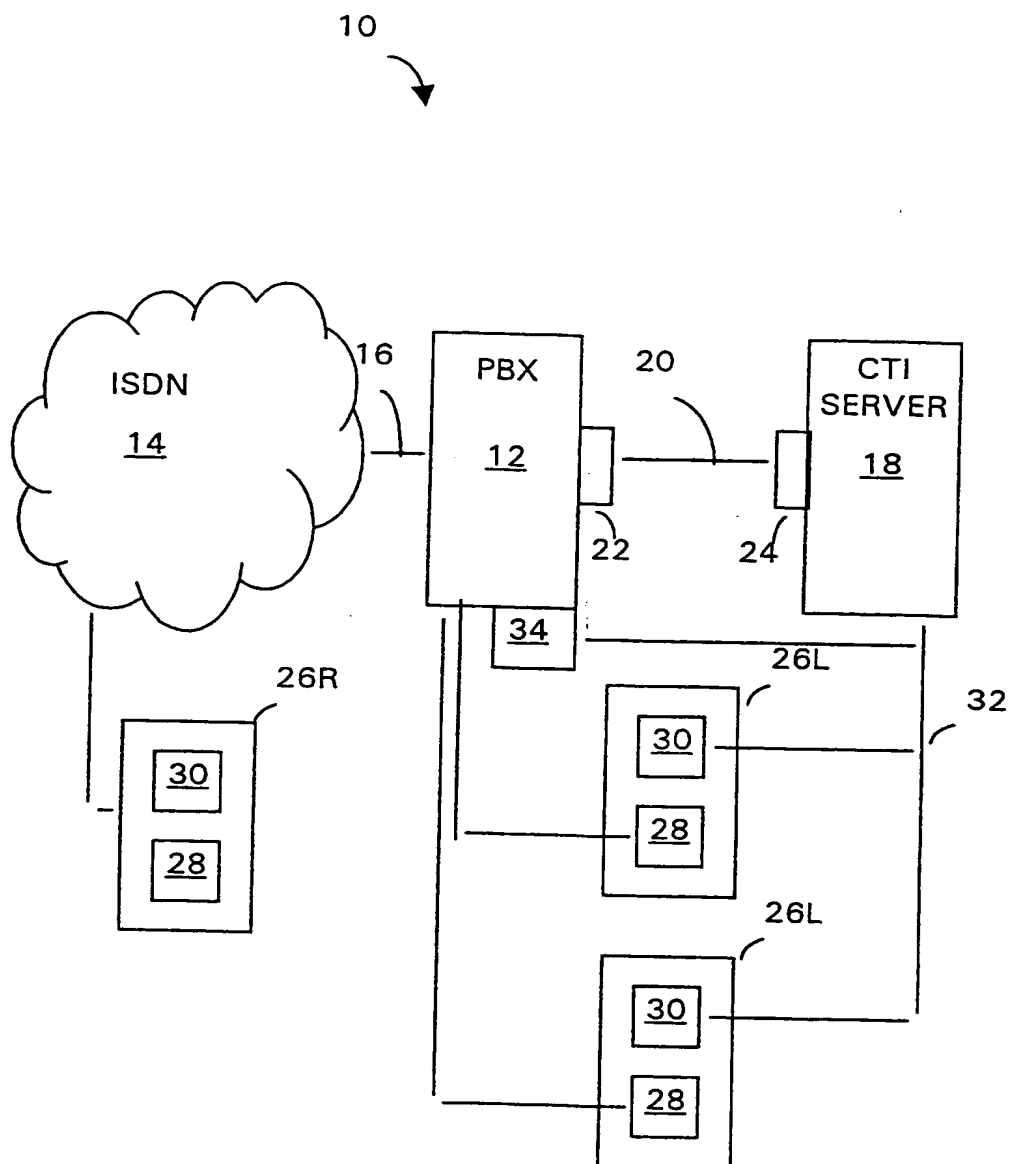


Fig. 1

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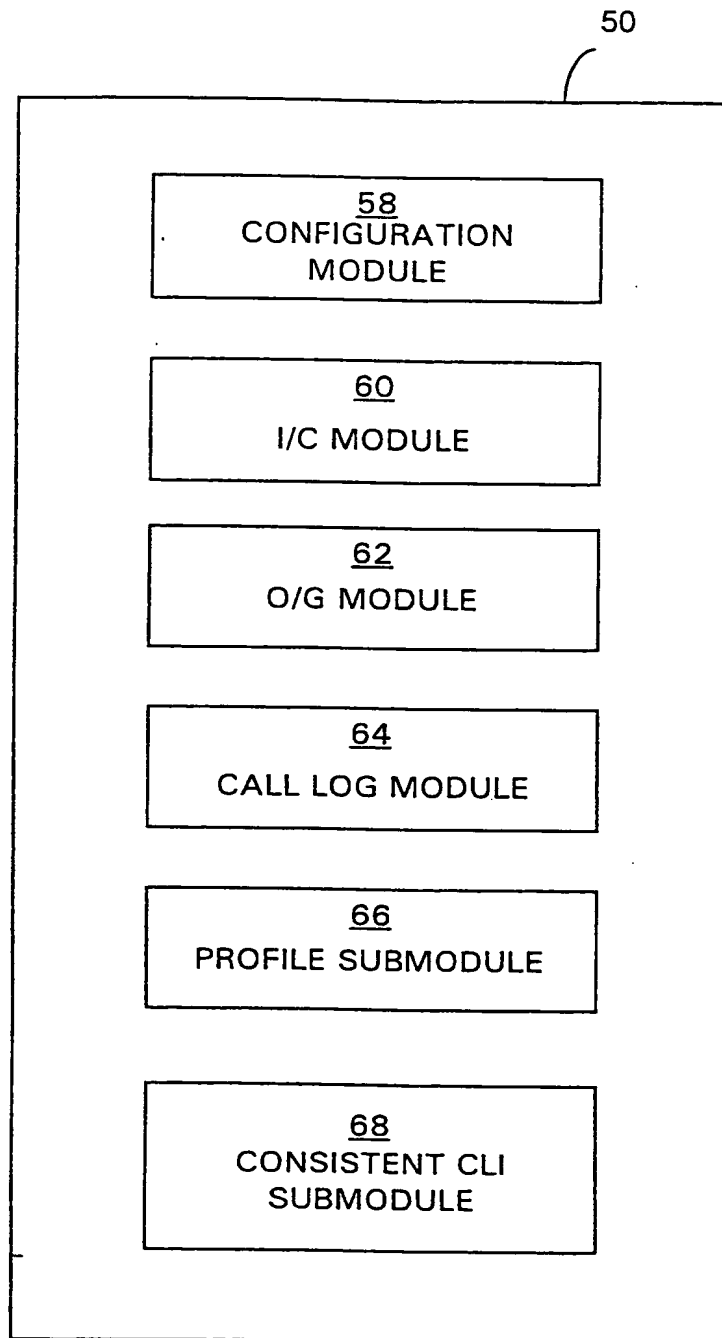


Fig. 4

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54B

<u>CLIENT ID</u>	<u>NAME</u>
IP ADDRESS #001	ERIC
IP ADDRESS #100	STEVE
IP ADDRESS #101	BOB
IP ADDRESS #102	DOUG
IP ADDRESS #200	CHARLIE

Fig. 6

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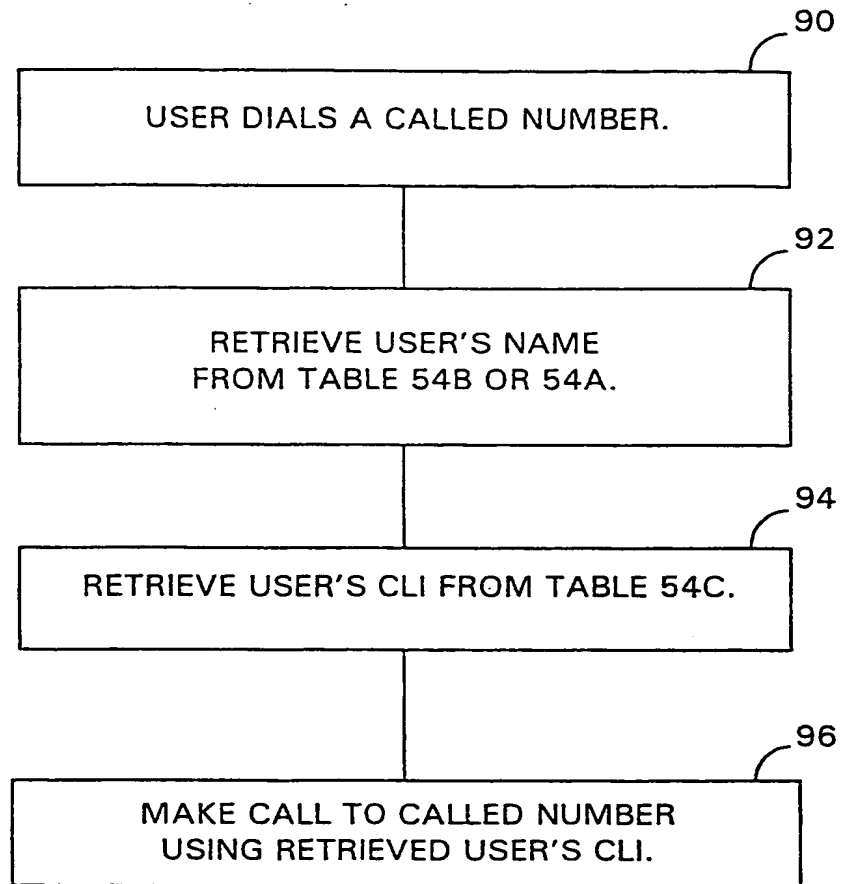


Fig. 8